

FROM IMPOSSIBLE TO POSSIBLE THANKS MOTION: A NEW TRANSPARENCY EFFECT

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Abstract

In the present study we show the first case of a motion pattern eliciting a transparency perception without stratification indexes and plausible colors combination for transparency. In the first experiment we show that this transparency perception is perceived when colors combinations are plausible but also implausible with transparency. Three changing in width juxtaposed surfaces, which do not present any stratification cues, are perceived as a moving transparent square that covers/uncovers a second square both when the greyscale colour combination is plausible or implausible with the transparency rules. In the second experiment we manipulate speed (i) and shape of surfaces (ii). The speeds of the juxtaposed surfaces were now implausible with two moving squares; (ii) The heights of the surfaces were now also implausible with two moving squares. Data show that transparency is effected by the shape but not by the speed of the juxtaposed surfaces.

We introduce here a new phenomenon of transparency induced by motion (see Masin, 2006, for a recent test of the most popular explicative models of transparency). The original aspect of our stimuli consists on the simultaneously absence of two transparency cues, which usually are present together or at least independently: (a) stratification indexes and (b) a greyscale colours combination plausible with a physical transparency (see Ramachandran 1989; Stoner et al. 1990). Thus, in our stimuli the key factor to obtain transparency and overlapping perception seems to be the introduction of motion. Regarding motion transparency, it has already been showed that motion could lead to perception of transparency even when the colours combination is in conflict with the perception of transparency, but stratification indexes were always present (Hupé and Rubin, 2000). To investigate the role of motion in our stimuli, we ran two experiments.

Experiment 1 Methods

Subjects. Ten naive subjects (mean age 29 years, SD = 8.1 years) participated in the study. All had normal or corrected-to-normal visual acuity.

Stimuli. Two series of ten frames, one series had greyscale colours combination plausible with transparency (see figure 1), and the second series had implausible

greyscale colours combination (see figure 2). No stratification cues were present in both series of frames. These two frames series were also put together in two movies. Movie 1 presented implausible greyscale colour combination, while Movie 2 presented a plausible greyscale colours combination to the interpretation of the pattern as two overlapped squares in which one is transparent. Both patterns didn't present stratification indexes since our stimulus is composed by three juxtaposed surfaces, which changing their width during time.

Procedure. The first experiment was composed by two sessions. In the first session (static session) 10 naïve subjects (mean age 29, SD = 8.1) were presented to the two randomised series of ten frames. For each frame, presented three times, subject's task was to spontaneously describe the pattern, no other information were given to subjects. In the second session (dynamic session) the same subject were exposed to the two movies composed by the frames of the static conditions. The order of presentation for the two movies was randomised. The movies were presented one time. The subject's task was to spontaneously describe the event.

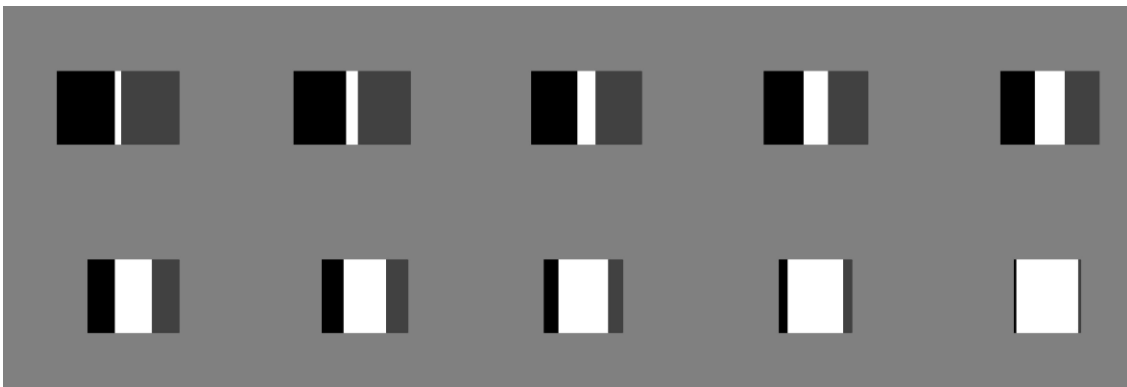


Figure 1.



Figure 2.

Results and discussion

All participants gave very similar results. All frames in the *static session* were described as three adjacent rectangles of different greyscale colour and width, but same heights, neither transparency nor stratification was perceived in both conditions. In our case the absence of stratification indexes seems to push subjects to see coplanar figures in static frames irrespectively of greyscale colours combination. This means that plausible greyscale colour combination is not enough as a cue for transparency in the static view (see Metelli, 1974).

On the opposite, the two movies were interpreted by all subjects as a transparent square on the left that covers/discover the right square in both color conditions. It seems that visual system reorganizes the three rectangles, which physically change continuously their size, grouping them into two square: one transparent moving square, which slides to cover/discover a second stationary square. The conflict between the perception of three coplanar figures changing their width or the perception of a single square in motion seems to be solved by the visual system into a transparency motion effect, which permit to perceptually reduce the surfaces number. This solution seems to be immediate and resistant, since it leads into an illusive transparency also when colour combination are inconsistent with transparency. The transparency effect seems to be very resistant to previous experience: once the spontaneous descriptions were done, observers were instructed on the possible presence of three juxtaposed surfaces changing their width. However, when looking the two movies, they affirmed that it was very hard to see three rectangles instead the two squares.

Experiment 2

In the second experiment we tested the role of time synchrony and shape coherence with the two squares perceptual solution.

Methods

Subjects. Five naive subjects (mean age 30 years, SD = 2.2 years) participated in the study. All had normal or corrected-to-normal visual acuity.

Stimuli. Time synchrony: Ten movies with progressive less synchronization between the three surfaces were used here, only a perfect synchronization between the three surfaces would be compatible with the transparent solution.

Shape coherence: Ten movies with progressive reduction of the height of the second surface were used here, only an identical height between the three surfaces would be compatible with the transparent solution.

Procedure. Each movie was presented three times in random order, the subject task was to say if transparency was present or not.

Result and discussion

Results showed that transparency was still present when the synchrony between the parts was far to be perfect while changing the height of the second surface breaks down the illusory impression. It seems that the asynchrony of the two moving edges

have an effect only on the perceived material quality of the transparent square, which is seen as elastic one, contracting and expanding in turns like a worm or a caterpillar (see caterpillar display of Michotte, 1963). Thus, this elastic solution permits to visual system to perceive transparency since the two moving margins instead to belong a two different coloured surfaces are still grouped into a single surface: an stretchy square.

In summary we presented here the first case of a motion pattern eliciting a transparency perception without stratification indexes and plausible colours combination for transparency and we tried to demonstrate how motion and shape coherence during time but not synchrony seemed to be the keys factor to obtain this kind of percept.

References

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